

## **What is claimed is:**

### **[Claim 1]**

1. A method for analyzing waviness of a surface, the method comprising:  
measuring a height of the surface over a predetermined distance with a surface profiling instrument;  
processing data gathered with the surface profiling instrument to produce a set of data points indicative of a waviness profile;  
selecting a subset of the set of data points;  
determining a peak value and a valley value of the subset;  
calculating a waviness height of the subset based on the peak and valley values;  
repeating the selecting, determining, and calculating steps for additional subsets until all members of the set of data points have been selected; and  
selecting a maximum waviness height value from the waviness heights calculated for each subset.

### **[Claim 2]**

2. The method of claim 1 wherein the surface profiling instrument is a profilometer.

### **[Claim 3]**

3. The method of claim 1 further comprising comparing the maximum waviness height value to a threshold value and generating an acceptance signal if the maximum waviness height value is less than the threshold value.

### **[Claim 4]**

4. The method of claim 1 further comprising comparing the maximum waviness height value to a threshold value and generating a reject signal if the maximum waviness height value is greater than the threshold value.

### **[Claim 5]**

5. The method of claim 1 wherein each subset includes at least one data point included in a previous subset.

### **[Claim 6]**

6. The method of claim 1 wherein each subset includes at least one data point not included in a previous subset.

### **[Claim 7]**

7. The method of claim 1 wherein each subset includes a predetermined number of consecutive data points.

**[Claim 8]** 8. The method of claim 1 wherein the predetermined distance is at least two times greater than a specified number of cutoffs over which waviness assessment is conducted.

**[Claim 9]** 9. A method for analyzing waviness of a machined surface, the method comprising:

- obtaining a data set having a plurality of sequential data points indicative of a waviness profile of the machined surface;

- establishing a size of a data processing window representing a predetermined number of sequential data points;

- positioning the data processing window to include a first data point in the data set;

- selecting a subset of the data set;

- determining a peak value and a valley value of the subset;

- calculating a peak-to-valley waviness height based on the difference between the peak and valley values;

- indexing the data processing window to select another subset having at least one different member than a previous subset;

- repeating the selecting, determining, calculating, and indexing steps until each data point in the data set has been selected at least once.

**[Claim 10]** 10. The method of claim 9 wherein the data processing window is indexed by one data point each iteration such that a first sequential data point in the subset is removed from the subset and the next data point in sequence in the data set is added to the subset.

**[Claim 11]** 11. The method of claim 9 wherein the data processing window is indexed by more than one data point each iteration.

**[Claim 12]** 12. The method of claim 9 wherein the data processing window size is five times greater than a cutoff length representative of a spacial frequency.

**[Claim 13]** 13. A method for analyzing waviness of a surface, the method comprising:

- measuring a height of the surface with a surface profiling instrument to obtain data over a predetermined distance;

- fitting a regression line to the data;

subtracting the regression line from the data over the predetermined distance;  
filtering the data to determine a waviness profile having a set of data points;  
selecting a subset of the set of data points that includes a predetermined number of consecutive data points;  
determining a peak value and a valley value of the subset;  
calculating a peak-to-valley height of the subset based on a difference between the peak and valley values;  
repeating the selecting, determining, and calculating steps for additional subsets until all data points have been selected at least once;  
selecting a maximum waviness height value from the peak-to-valley heights calculated for each subset;  
comparing the maximum height waviness value to a threshold value indicative of a localized waviness region; and  
rejecting the part if the maximum waviness height value exceeds the threshold value.

**[Claim 14]** 14. The method of claim 13 further comprising the step of accepting the part if the maximum waviness height value does not exceed the threshold value.

**[Claim 15]** 15. The method of claim 13 wherein the surface is adapted to mate to a gasket.

**[Claim 16]** 16. The method of claim 15 wherein the surface is disposed on an engine block.

**[Claim 17]** 17. The method of claim 15 wherein the surface is disposed on a cylinder head.

**[Claim 18]** 18. The method of claim 13 wherein the surface is a portion of a transmission component.

**[Claim 19]** 19. The method of claim 13 wherein each subset includes the same number of data points.

**[Claim 20]** 20. The method of claim 13 wherein a first data point in the first subset and a last data point in the last subset are not members of any other subset.

**[Claim 21]** 21. The method of claim 13 wherein the predetermined distance is greater than 35mm.